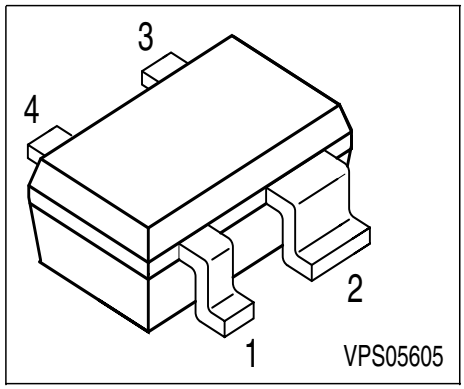
NPN Silicon RF Transistor



- For highest gain low noise amplifier at 1.8 GHz
- Outstanding G_{ms} = 21 dB
  Noise Figure F = 0.9 dB
- Gold metallization for high reliability
- SIEGET 45 - Line

ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration						Package
BFP540	ATs	1=B	2=E	3=C	4=E	-	-	SOT343

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	4.5	V
Collector-emitter voltage	V_{CES}	14	
Collector-base voltage	V_{CBO}	14	
Emitter-base voltage	V_{EBO}	1	
Collector current	I_C	80	mA
Base current	I_B	8	
Total power dissipation[1)] $T_S \leq 77°C$	P_{tot}	250	mW
Junction temperature	T_j	150	°C
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[2)]	R_{thJS}	≤ 290	K/W

[1] T_S is measured on the collector lead at the soldering point to the pcb

[2] For calculation of R_{thJA} please refer to Application Note Thermal Resistance

Electrical Characteristics at T_A = 25°C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	4.5	5	-	V
Collector-emitter cutoff current V_{CE} = 14 V, V_{BE} = 0	I_{CES}	-	-	10	µA
Collector-base cutoff current V_{CB} = 5 V, I_E = 0	I_{CBO}	-	-	100	nA
Emitter-base cutoff current V_{EB} = 0.5 V, I_C = 0	I_{EBO}	-	-	10	µA
DC current gain I_C = 20 mA, V_{CE} = 3.5 V	h_{FE}	50	110	200	-

Electrical Characteristics at T_A = 25°C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency I_C = 50 mA, V_{CE} = 4 V, f = 1 GHz	f_T	21	30	-	GHz
Collector-base capacitance V_{CB} = 2 V, f = 1 MHz	C_{cb}	-	0.14	0.24	pF
Collector emitter capacitance V_{CE} = 2 V, f = 1 MHz	C_{ce}	-	0.33	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{eb}	-	0.65	-	
Noise figure	F				dB
I_C = 5 mA, V_{CE} = 2 V, f = 1.8 GHz, $Z_S = Z_{Sopt}$		-	0.9	1.4	
I_C = 5 mA, V_{CE} = 2 V, f = 3 GHz, $Z_S = Z_{Sopt}$		-	1.3	-	
Power gain, maximum stable[1)] I_C = 20 mA, V_{CE} = 2 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 1.8 GHz	G_{ms}	-	21.5	-	dB
Power gain, maximum available[1)] I_C = 20 mA, V_{CE} = 2 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 3 GHz	G_{ma}	-	16	-	dB
Transducer gain	$\lvert S_{21e}\rvert^2$				dB
I_C = 20 mA, V_{CE} = 2 V, $Z_S = Z_L$ = 50 Ω, f = 1.8 GHz		16	18.5	-	
I_C = 20 mA, V_{CE} = 2 V, $Z_S = Z_L$ = 50 Ω, f = 3 GHz		-	14.5	-	
Third order intercept point at output[2)] V_{CE} = 2 V, I_C = 20 mA, f = 1.8 GHz, $Z_S = Z_L$ = 50 Ω	IP_3	-	24.5	-	dBm
1dB Compression point at output I_C = 20 mA, V_{CE} = 2 V, $Z_S = Z_L$ = 50 Ω, f = 1.8 GHz	P_{-1dB}	-	11	-	

[1] $G_{ma} = |S_{21e} / S_{12e}| (k-(k^2-1)^{1/2})$, $G_{ms} = |S_{21e} / S_{12e}|$

[2] IP3 value depends on termination of all intermodulation frequency components.
Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

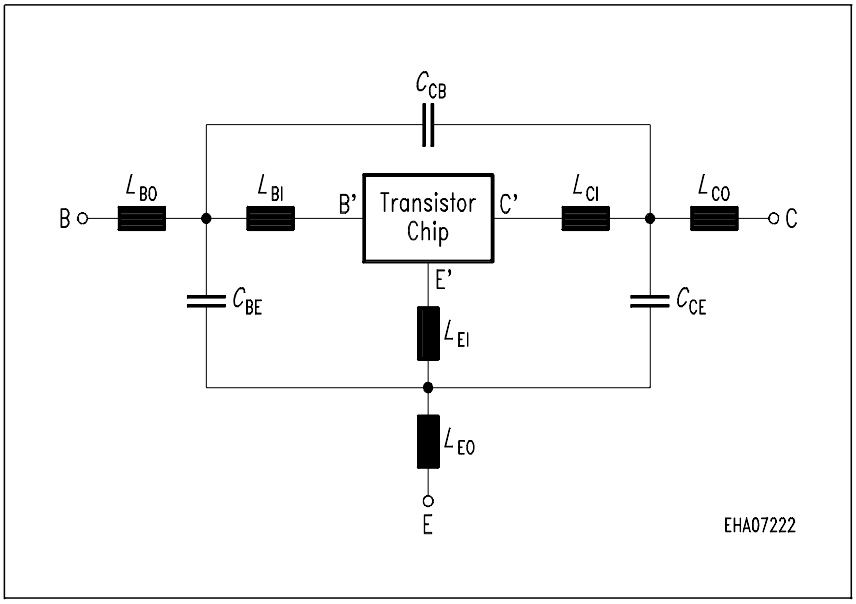
SPICE Parameter (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax):

Transitor Chip Data:

IS =	82.84	aA	BF =	107.5	-	NF =	1	-
VAF =	28.383	V	IKF =	0.48731	A	ISE =	11.15	fA
NE =	3.19	-	BR =	5.5	-	NR =	1	-
VAR =	19.705	V	IKR =	0.02	A	ISC =	19.237	aA
NC =	1.172	-	RB =	5.4	Ω	IRB =	0.72983	mA
RBM =	1.3	Ω	RE =	0.31111	-	RC =	4	Ω
CJE =	1.8063	fF	VJE =	0.8051	V	MJE =	0.46576	-
TF =	6.76	ps	XTF =	0.4219	-	VTF =	0.23794	V
ITF =	1	mA	PTF =	0	deg	CJC =	234	fF
VJC =	0.81969	V	MJC =	0.30232	-	XCJC =	0.3	-
TR =	2.324	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	XTB =	0	-	EG =	1.11	eV
XTI =	3	-	FC =	0.73234		TNOM	300	K

All parameters are ready to use, no scalling is necessary.

Package Equivalent Circuit:



L_{BI} =	0.47	nH
L_{BO} =	0.53	nH
L_{EI} =	0.23	nH
L_{EO} =	0.05	nH
L_{CI} =	0.56	pH
L_{EO} =	0.58	nH
C_{BE} =	136	fF
C_{CB} =	6.9	fF
C_{CE} =	134	fF

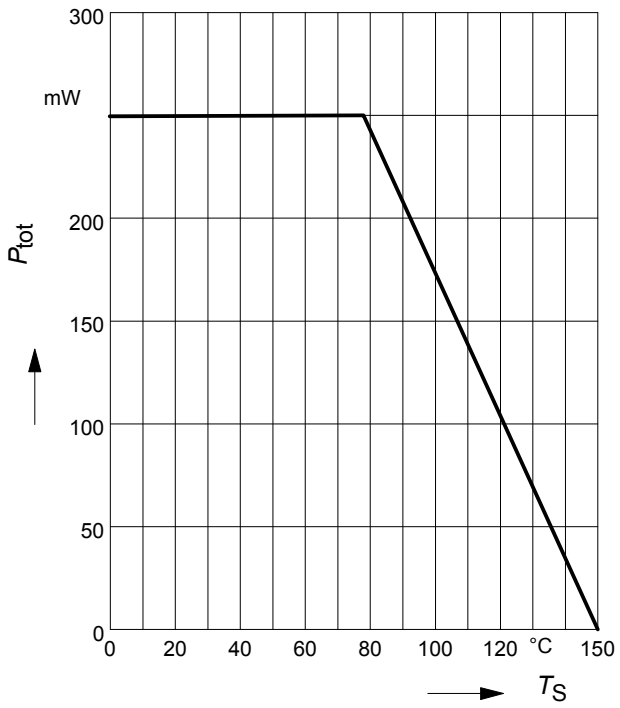
Valid up to 6GHz

For examples and ready to use parameters
please contact your local Infineon Technologies
distributor or sales office to obtain a Infineon
Technologies CD-ROM or see Internet:
http//www.infineon.com/silicondiscretes

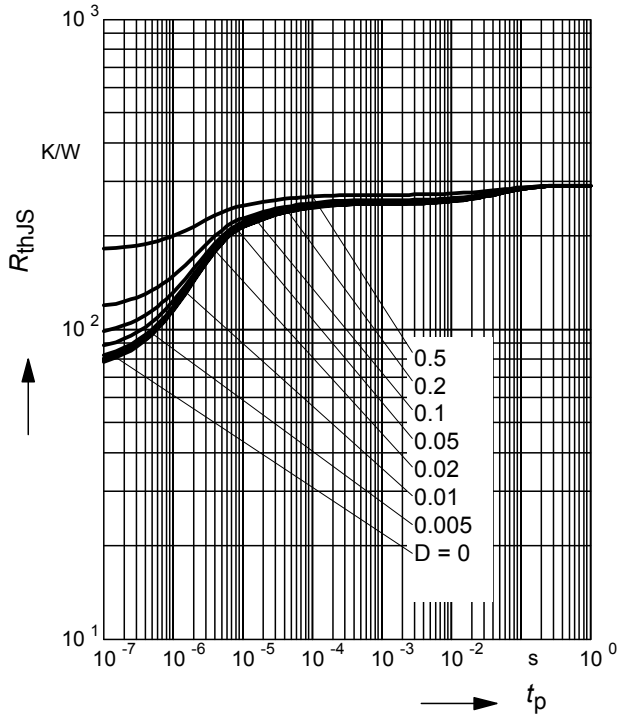
For non-linear simulation:

- Use transistor chip parameters in Berkeley SPICE 2G.6 syntax for all simulators.
- Simulation of the package is not necessary for frequencies < 100MHz.
  For higher frequencies please add the wiring of the package equivalent circuit around the non-linear transistor.

Total power dissipation $P_{tot} = f(T_S)$

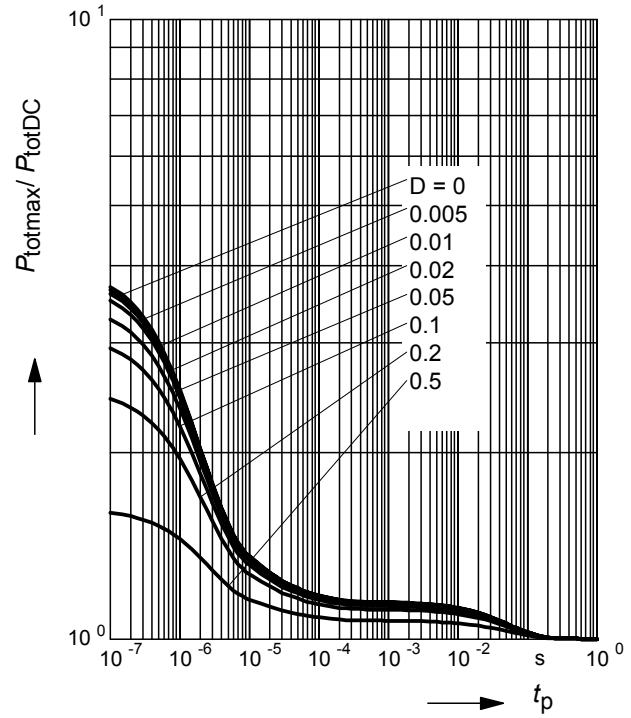


Permissible Pulse Load $R_{thJS} = f(t_p)$



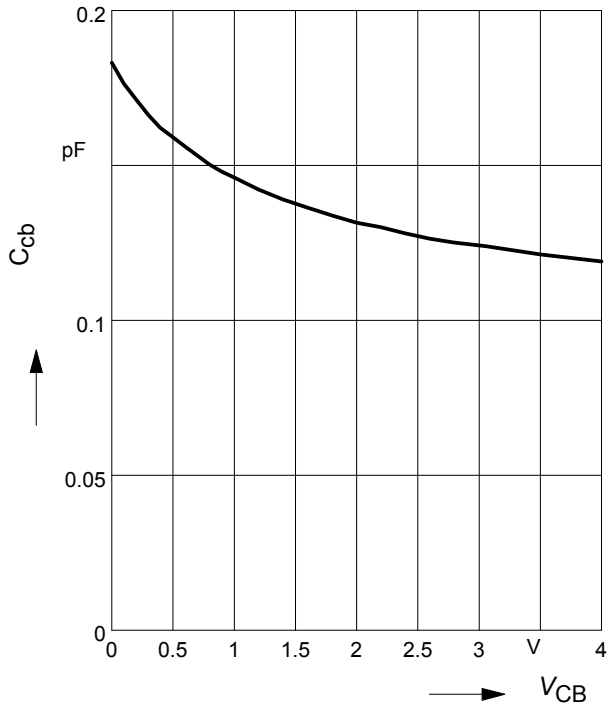
Permissible Pulse Load

$P_{totmax}/P_{totDC} = f(t_p)$



Collector-base capacitance $C_{cb} = f(V_{CB})$

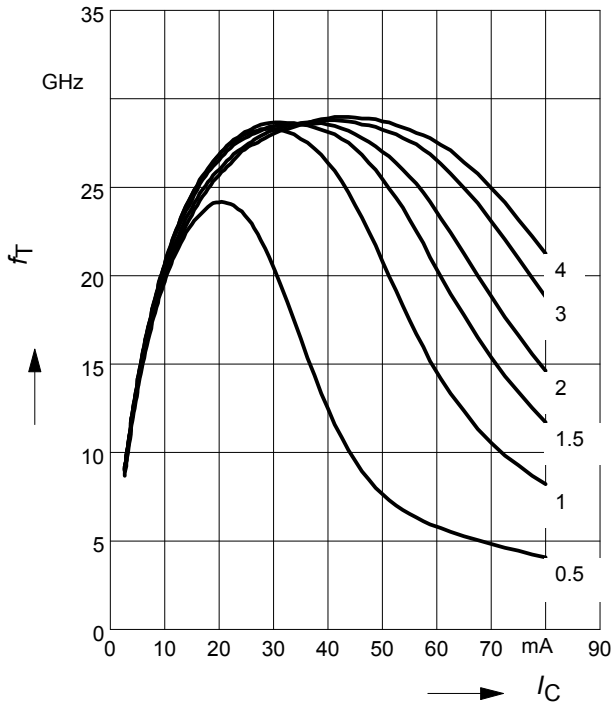
f = 1MHz



Transition frequency $f_T = f(I_C)$

f = 1GHz

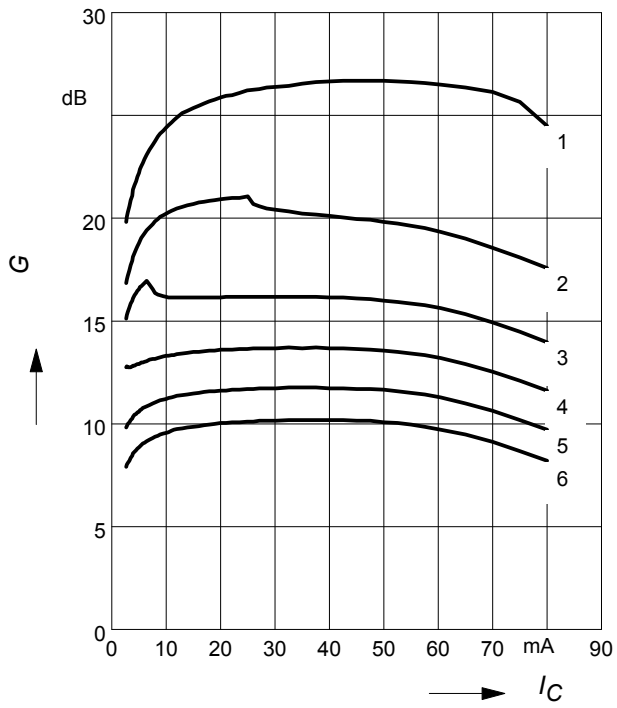
V_{CE} = Parameter in V



Power gain G_{ma}, $G_{ms} = f(I_C)$

V_{CE} = 2V

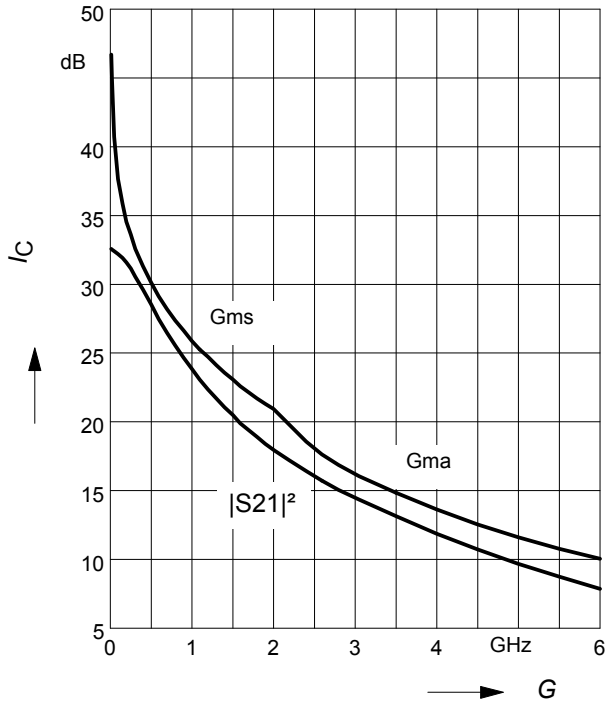
f = Parameter in GHz



Power Gain G_{ma}, $G_{ms} = f(f)$,

$|S_{21}|^2 = f$ (f)

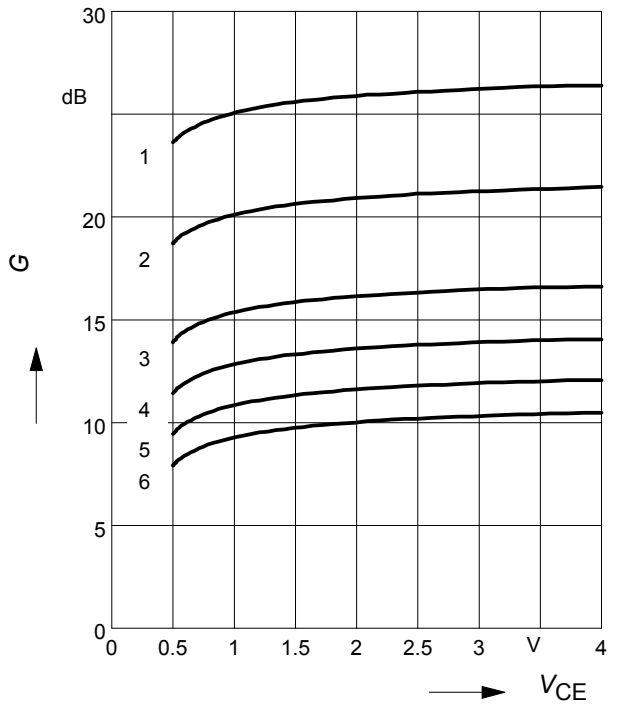
V_{CE} = 2V, I_C = 20mA



Power gain G_{ma}, $G_{ms} = f(V_{CE})$

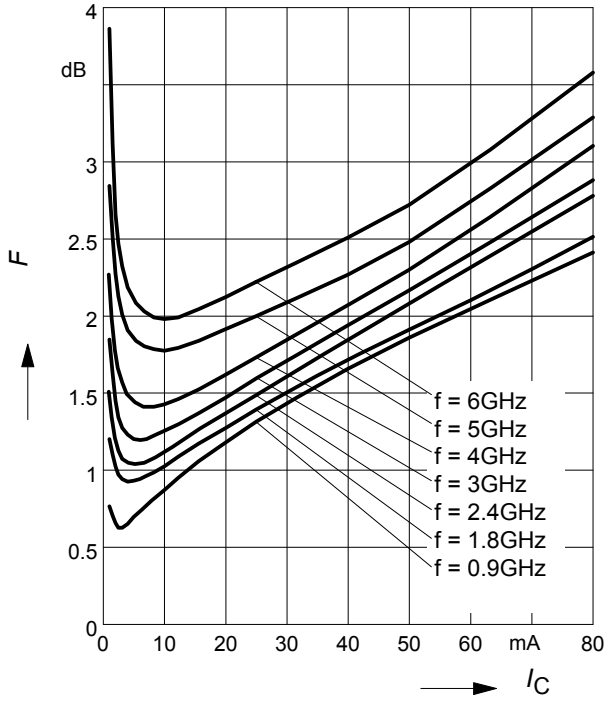
I_C = 20mA

f = Parameter in GHz



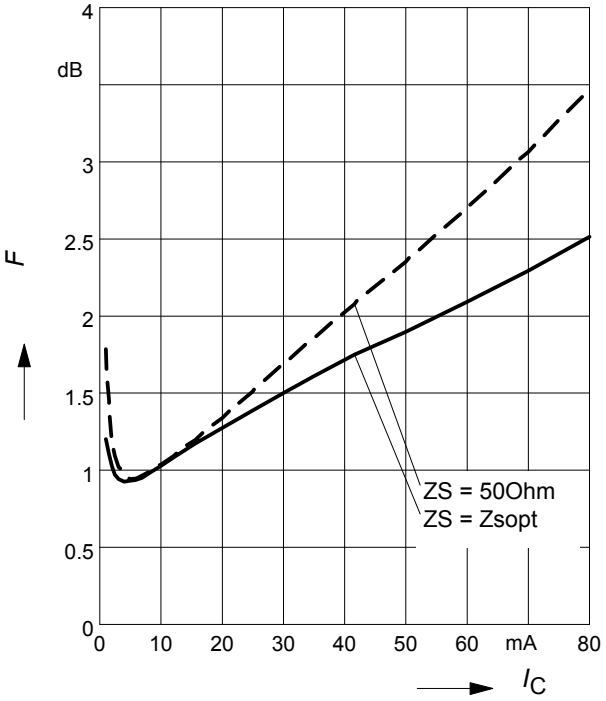
Noise figure $F = f(I_C)$

V_{CE} = 2V, $Z_S = Z_{Sopt}$



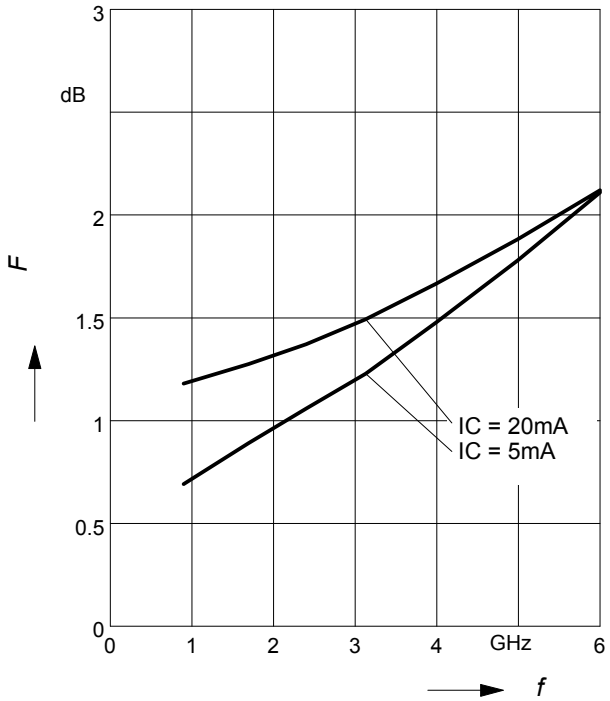
Noise figure $F = f(I_C)$

V_{CE} = 2V, f = 1.8GHz



Noise figure $F = f(f)$

V_{CE} = 2V, $Z_S = Z_{Sopt}$



Source impedance for min. noise figure vs. frequency

V_{CE} = 2V, I_C = 5mA / 20mA